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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
08/931,125	09/16/97	LEE	H P54508

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EXAMINER
PORTKA, G

ART UNIT	PAPER NUMBER
2187	28

DATE MAILED: 05/31/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

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Office Action Summary

Application No.
08/931,125

Applicant(s)
Lee

Examiner
Gary J. Portka

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— The MAILING DATE of this communication appears on the cover sheet with the correspondence address —

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on Mar 27, 2001

2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-8 is/are pending in the applica

4a) Of the above, claim(s) _____ is/are withdrawn from considera

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1-8 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirem

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☐ Notice of References Cited (PTO-892)

18) ☐ Interview Summary (PTO-413) Paper No(s). _____

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

19) ☐ Notice of Informal Patent Application (PTO-152)

17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 22

20) ☐ Other:

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DETAILED ACTION

Continued Prosecution Application

1. The request filed on March 27, 2001 for a Continued Prosecution Application (CPA) under 37 CFR 1.53(d) based on parent Application No. 08/931,125 is acceptable and a CPA has been established. An action on the CPA follows.
2. Claims 1, 6, and 8 have been amended by Applicant. Claims 1-8 remain pending.

Information Disclosure Statement

3. The information disclosure submitted January 8, 2001 (paper no. 22) was considered, except that the Japanese Office Action dated 12/12/2000 was not considered because no translation nor statement of relevance was provided. See 37 CFR 1.98(a)(3).

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
5. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 6 recites eighth means which reads old parity from the disk drive, after the seventh means writes new data and parity to the disk drive, if no old parity information exists in the corresponding cache, and moving this old parity information from the disk drive to the cache to update it. This is vague and indefinite for the following two reasons. First, it appears that if the old parity was not in the cache, then it is loaded into the cache by the fourth claimed means, and therefore the eighth means

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would never read the old parity from the disk drive (because it already exists in the corresponding cache after the seventh means step). Second, since the old data and old parity have already been used to calculate the new parity by the fifth claimed means, it is not clear how reloading old parity to the cache would provide an "update" of parity information.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

7. Claims 1-2 and 6-8 are rejected under 35 U.S.C. 102(e) as being anticipated by Jones, U.S. Patent 5,572,660.

8. As to claim 1, Jones discloses a memory system comprising:

a. Plurality of defect-adaptive devices (214-1 through 214-8) as claimed having a first region storing information needed for data recovery (parity), and a second region storing data (see Figure 2D, and column 10 lines 7-18);

b. Plurality of caches (254-1 through 254-8) respectively coupled to the devices, each for storing parity information blocks needed for data recovery for the corresponding device (see Figure 2D, and column 10 lines 15-26);

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c. Controller (210) coupled to each device and cache, with means for selectively controlling writing, reading, and obtaining of parity information to/from each memory device, and storing parity information obtained from a device in a corresponding cache (see Figure 3E, column 2 line 62 through column 4 line 6, in particular column 3 lines 30-39; column 10 lines 15-26, and column 11 line 55 to column 12 line 13).

9. As to claim 2, Jones discloses that the controller comprises means for determining if the information needed for data recovery is in the cache (see Figure 3D item 344, and Figure 3E item 370).

10. As to claim 6, Jones discloses a RAID system comprising:

a. Plurality of disk drives (214-1 through 214-8) with region storing data blocks and region storing parity information (see Figure 2D, and column 10 lines 7-18);

b. Plurality of caches (254-1 through 254-8) each connected to a corresponding drive and storing parity information (see Figure 2D, and column 10 lines 15-26);

c. Controller (210) coupled to each disk drive and cache selectively controlling write of data and parity comprising means to:

i. Select a disk drive upon receiving write instruction (see Figure 3A items 308 and 330);

ii. Read old data from the disk drive (see Figure 3C item 360);

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- iii. Determine if old parity to be read from disk is accessed in the corresponding cache, and if not then to read the old parity from the disk drive, and load the cache with old parity (see Figure 3E items 370, 376-382, and column 11 line 55 to column 12 line 13);
- iv. Obtain new parity by performing XOR on old data, old parity and new data (see Figure 3F item 390, and column 9 line 16 equation);
- v. Load the corresponding cache with new parity (see Figure 3F item 392);
- vi. Write the new data and new parity on the disk drive (see Figure 3F item 394, and column 3 lines 25-40).

It is further noted that the controller 210 comprises means to read old parity from the disk drive after writing of the new data and parity to the disk drive, if no old parity exists in the cache, and moving the old parity from the disk drive to the corresponding cache, to the extent these elements are claimed, as described for step iii. above, for the next write instruction. (See also 35 USC 112 rejection above.)

11. As to claim 7, Jones discloses the method for writing and reading a RAID as recited, the step for reducing overhead during read of data for recovery to improve data I/O performance met by the functionally equivalent elements performing the steps described above with regard to claims 1-2 and 6. Applicant's own specification at page 6 lines 16-20 describes that two time reading and writing of disk drives is required when updating data with parity, which results in a large overhead. Jones therefore teaches a step for reducing overhead during a read for data recovery by avoiding the need to access the disk two times when the required data is in a cache.

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12. As to claim 8, Jones discloses the coupled controller, caches, and disks, and that the caches store data recovery information, as described above with regard to claims 1-2 and 6. The determining of information needed for recovery in a disk by using information for data recovery stored in the corresponding cache is described at Figure 3F item 390 and column 9 line 16 equation (in Figure 3D, a cache hit in the write back cache at 344 means that old parity is in the cache, which is read to perform the calculation at 390 of Figure 3F).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones, U.S. Patent 5,572,660, in view of Holland et al., U.S. Patent 5,455,934.

15. As to claim 3, Jones does not disclose that the information needed for data recovery is sequentially arranged from the most outer cylinder. However, it is well known that the sequential nature of disk access invites a transfer mechanism sequentially from some position, thus improving performance by reducing seek time. As further taught by Holland, arrangement of information on a disk from the outermost cylinders results in higher sustained data transfer rates (see column 9 lines 25-30). It is clear from Jones at column 2 lines 34-58 that the accessing of the parity data in RAID

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systems limits the performance of these systems, and therefore the advantage of faster access due to reduced seek time, and higher sustained data rates would have motivated an artisan to arrange this information from the outermost cylinder. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to sequentially arrange the recovery information from the most outer cylinder in Jones, because this method reduces seek time, results in higher sustained data rates, and therefore improves performance.

16. As to claim 4, Jones discloses that parity information needed for data recovery is modified to a value obtained through a calculation of new data recovery information (see column 9 lines 8-21).

17. As to claim 5, Jones discloses XORing of previous data, corresponding parity information, and new data (see column 9 line 16 equation).

Response to Arguments

18. Applicant's arguments filed March 27, 2001 have been fully considered but they are not persuasive.

Applicants have argued that Jones does not teach a unique one cache corresponds to a unique one disk, in a one-to-one caching. Examiner disagrees; the Abstract states that each drive has a "dedicated" cache, and the embodiment of Figure 2D is described as "similar to that of FIG. 2 with the exception that the parity information is stored and distributed among the plurality of disk drives...". The intention in the reference that the disk drives each have a dedicated, and thus unique corresponding cache, as shown within each of Figures 2 through 2D, is clear.

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Applicants have argued that claim 7 is a step-plus-function claim and as such, incorporates the structure described in the disclosure as performing the function. As stated previously and herein, it appears that the structure that performs this function is intended to be as recited in the present claims. It is further noted as stated above that the present specification at page 6 lines 16-20 defines the large overhead as the two time reading and writing required on the disk drives when updating data and parity. The Applicant's step for reducing overhead then must be the use of the caches to avoid the need to read and write the disk drives when possible, as described for example in the remaining claims. Since the structure as provided by the remaining claims is still rejected over Jones, it is therefore maintained that the function and equivalent structure that reduces overhead is met by Jones.

Applicants have argued that there is no specific teaching nor motivation in the prior art for combining Jones and Holland, and that proper analysis of level of ordinary skill in the art was necessary and was not made. Examiner does not agree; the art of record establishes that the outer tracks of a disk offer improved performance, and as stated in the previous action it is well known that disks are accessed serially; thus it would have been obvious to one of ordinary skill in the art to access from the outermost track for performance-limiting data. It is well known in the art, and common sense, that performance-limiting data be configured or stored in such a manner to be accessed faster than other data, in the same manner for example as data which is frequently or recently accessed gets stored into a cache. As cited, Jones teaches that the parity data is such performance-limiting data, and therefore the rationale for the combination (of accessing the parity data of Jones sequentially from the outer tracks) is maintained.

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Conclusion

19. A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) days from the mail date of this letter. Failure to respond within the period for response will result in Abandonment of the application (see 35 USC 133, MPEP 710.02, 710.02(b)).

20. Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 305-9731 or (703) 308-6606

(for formal communications intended for entry and for informal or draft communications - please label informal communications "PROPOSED" or "DRAFT").

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA., Fourth Floor (Receptionist).

21. Any inquiry concerning this communication from the Examiner should be directed to Gary J. Portka at telephone number (703) 305-4033. The Examiner can normally be reached on weekdays from 9:00 A.M. to 5:30 P.M.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Do Yoo, can be reached on (703) 308-4908. The fax phone number for this Group is (703) 305-9731.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist, whose telephone number is (703) 305-3900.

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Gary J. Portka

Patent Examiner

March 29, 2001

A handwritten signature in cursive script, reading "Gary J. Portka". The signature is written in black ink and is positioned to the right of the printed name.